

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

IGNATYEV, et al.:

Group Art Unit: 1626

Serial No.:

10/594,966

Examiner: Loewe, Sun Jaey

Filed:

September 29, 2006

For:

Ionic Liquids having fluoroalkyltrifluoroborate anions

**DECLARATION UNDER 37 C.F.R. § 1.132**

Assistant Commissioner for Patents  
Alexandria, Virginia 22313-1450

SIR:

I, Nikolai (Mykola) Ignatyev, am a citizen of Ukraine residing at, Duisburg Germany;

I am a physical and organic chemist by training and experience. The degree "Doctor of Science" was bestowed on me by the National Academy of Science, Institute of Organic Chemistry of Kiev, Ukraine, in 1980.

I hereby declare that

the better electrochemical stability of pyrrolidinium pentafluoroethyl-trifluoroborate in comparison to 1-ethyl-3-methylimidazolium pentafluoroethyl-trifluoroborate is statistically significant by the reason that the cyclic voltammetry method (CVA), which was used to determine the electrochemical window, has the statistic accuracy better then 0.1 V. Advanced electrochemical stability of pyrrolidinium pentafluoroethyltrifluoroborate is an "unexpected result", which is probably relate to the reduced proton activity of pyrrolidinium cation. That makes

the application of pyrrolidinium pentafluoroethyltrifluoroborate especially attractive as conducting salt in aprotic media, for example in electrolytes for Li-ion batteries. Imidazolium based ionic liquids, i.e. 1-ethyl-3-methylimidazolium pentafluoroethyltrifluoroborate, are not good for the application in Li-ion batteries technology by the reason of dramatic decrease in Li-ion battery's performance, that is certainly related to high proton activity (acidity) of imidazolium cation. The development "of "truly neutral" ionic liquids with stable inorganic or organic anions (non-chloride or bromide containing) has improved the situation substantially vis-à-vis the organic cation stability and further progress is expected" (in "Advances in Lithium-Ion Batteries", W.A. van Schalkwijk and B. Scrosati (eds.), Kluwer Academic/Plenum, Publisher, N.Y., Boston, Dordrecht, London, Moscow, 2002, Chapter 6 "Ionic Liquids for Lithium Ion and Related Batteries", p. 200, of which a copy is enclosed).

Pyrrolidinium pentafluoroethyltrifluoroborate is a unique combination of anion and cation that yields in the ionic liquid with high electrochemical stability and low viscosity for the application in high voltage energy storage devices.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 06. 01. 2009



Nikolai (Mykola) Ignatiyev